

CLAIMS

Claim 1 (Currently Amended): A solid component of catalyst for [[the]] (co)polymerization of ethylene, comprising titanium, magnesium, chlorine, an organo-oxygenated protic compound D_p, and a neutral electron-donor aprotic compound D, in the following molar ratio ranges:

$$\text{Mg/Ti} = 1.0\text{-}50; \quad \text{D/Ti} = 1.0\text{-}15;$$

$$\text{Cl/Ti} = 6.0\text{-}100; \quad \text{D}_p/\text{D} = 0.05\text{-}3.$$

Claim 2 (Previously Presented): The solid component according to claim 1, additionally comprising an inert granular solid, in a quantity ranging from 10 to 90% by weight with respect to the total weight of the solid component.

Claim 3 (Currently Amended): The solid component according to claim 2, wherein said inert granular solid [[I]] is in a quantity ranging from 25 to 50% by weight.

Claim 4 (Currently Amended): The solid component according to ~~any of the previous claims~~ claim 2, wherein said inert granular solid [[I]] is selected from ~~granular inorganic solids included in~~ the group consisting of: silica, titania, silico-aluminates, calcium carbonate[[,]] and magnesium chloride[[,]]; and the having average sizes size of the inert granule ranging solid is from 10 μm to 300 μm.

Claim 5 (Currently Amended): The solid component according to claim 4, wherein said ~~solid I consists of~~ inert granular solid comprises microspheroidal silica having an average diameter ranging from 20 to 100 μm, a BET surface area ranging from 150 to 400 m²/g, a total porosity equal or higher than 80% and an average pore radius of 50 to 200 Å.

Claim 6 (Currently Amended): The solid component according to ~~any of the previous~~
~~claims claim 1, characterized by the following wherein the~~ molar ratio ranges among the
~~constituents are:~~

$$\begin{array}{ll} \text{Mg/Ti} = 1.5-10; & \text{D/Ti} = 3.0-8.0; \\ \text{Cl/Ti} = 10-25; & \text{D}_p/\text{D} = 0.1-2.0. \end{array}$$

Claim 7 (Currently Amended): The solid component according to ~~any of the previous~~
~~claims claim 1, wherein said ratio~~ D_p/D ranges from 0.2 to 1.0

Claim 8 (Currently Amended): The solid component according to ~~any of the previous~~
~~claims claim 1, wherein said organo-oxygenated protic compound~~ D_p ~~is selected from~~
~~compounds comprises a compound~~ having ~~[[the]]~~ following formula (II):



wherein:

R is an aliphatic, cyclo-aliphatic or aromatic radical, optionally fluorinated,
containing from 1 to 30 carbon atoms,

A is ~~one of selected from~~ divalent groups having the formula CR^1R^2 , CO, SCO and
SO, ~~preferably CO or~~ CR^1R^2 , wherein each R^1 and R^2 is independently hydrogen or an
aliphatic or aromatic group having from 1 to 10 carbon atoms;

m is 0 or 1.

Claim 9 (Currently Amended): The solid component according to ~~any of the previous~~
~~claims claim 1, wherein said organo-oxygenated protic compound~~ D_p is selected from ~~the~~

group consisting of aliphatic or aromatic, ~~preferably aliphatic~~, alcohols and organic acids, having from 2 to 10 carbon atoms.

Claim 10 (Currently Amended): The solid component according to ~~any of the previous claims~~ claim 1, wherein said aprotic electron-donor compound D is a coordinating organic compound having from 3 to 20 carbon atoms, comprising at least one heteroatom ~~selected from~~ of non-metallic compounds of groups 15 and 16, ~~preferably at least one oxygen atom linked to a carbon atom.~~

Claim 11 (Currently Amended): The solid component according to ~~any of the previous claims~~ claim 1, wherein said electron-donor compound D is at least one selected from ~~compounds~~ the group consisting of ~~the groups of~~ ketones, ethers, esters, amines, amides, thioethers, and xanthates, linear or cyclic, and aliphatic or aromatic, having from 4 to 10 carbon atoms.

Claim 12 (Currently Amended): The solid component according to ~~any of the previous claims 10 or 11~~ claim 10, wherein said compound D is selected from the group consisting of dibutyl ether, dihexyl ether, methylethyl ketone, diisobutyl ketone, tetrahydrofuran, dioxane, ethyl acetate, and butyrolactone, ~~preferably tetrahydrofuran.~~

Claim 13 (Currently Amended): The solid component according to ~~any of the previous claims~~ claim 1, wherein said titanium is present in a quantity ranging from 1 to 10% by weight.

Claim 14 (Currently Amended): A process for ~~[[the]]~~ preparation of ~~[[a]]~~ the solid component according to ~~any of the previous claims from 1 to 13~~ claim 1, comprising ~~the following steps~~ in succession: (a) ~~formation~~ forming of a mixture and dissolution, in aprotic electron-donor compound D, of a magnesium chloride and a titanium compound having formula (I):



wherein each R^3 represents a hydrocarbyl or acyl radical having from 1 to 15 carbon atoms;

each X is selected from the group consisting of chlorine, bromine ~~[[or]]~~ and iodine; v is 3 or 4, and represents ~~[[the]]~~ an oxidation state of titanium,

a is a number ranging from 0 to v, with a molar ratio between magnesium and titanium ranging from 1/1 to 50/1;

(b) ~~partial separation of~~ partially separating the compound D from said mixture prepared in ~~step~~ (a) until a residue is obtained, solid at room temperature, wherein the D/Ti ratio ranges from 1.5 to 40,

(c) ~~formation of~~ forming a suspension of said solid residue in a liquid hydrocarbon medium,

(d) ~~addition to~~ adding said suspension of an organo-oxygenated protic compound D_p , in ~~such~~ a quantity that the molar ratio D_p/D ranges from 0.1 to 1.2 and maintaining the mixture for a period varying from 5 minutes to 5 hours.

Claim 15 (Currently Amended): The process according to claim 14, wherein, in ~~step~~ (a), comprising adding an inert granular solid, ~~is also added~~.

Claim 16 (Currently Amended): The process according to ~~the previous claim 15,~~ wherein said ~~inert solid-I~~ granular solid is selected from ~~granular inorganic solids included in~~ the group consisting of: silica, titania, silico-aluminates, calcium carbonate, and magnesium chloride, ~~having;~~ the granular solid has an average granule sizes size ranging from 10 μm to 300 μm .

Claim 17 (Currently Amended): The process according to ~~the previous claims 15 or 16~~ claim 15, wherein said inert granular solid ~~I consists of~~ has microspheroidal silica having an average diameter ranging from 20 to 100 μm , a BET surface area ranging from 150 to 400 m^2/g , a total porosity equal or higher than 80% and an average pore radius of 50 to 200 Å.

Claim 18 (Currently Amended): The process according to ~~any of the previous claims from 14 to 17~~ claim 14, wherein said titanium compound having formula (I) is selected from the group consisting of titanium chlorides, bromides, alcoholates and carboxylates.

Claim 19 (Currently Amended): The process according to ~~any of the previous claims from 14 to 17~~ claim 14, wherein said compound having formula (I) in ~~step~~ (a) is titanium trichloride.

Claim 20 (Currently Amended): The process according to ~~any of the previous claims from 14 to 19~~ claim 14, wherein said magnesium chloride is in amorphous form.

Claim 21 (Currently Amended): The process according to ~~any of the previous claims from 14 to 20~~ claim 14, wherein, in said ~~step~~ (a), the atomic ratio between magnesium and titanium ranges from 1.0 to 50 and the ratio (D moles)/(Ti atoms) ranges from 5 to 100.

Claim 22 (Currently Amended): The process according to ~~any of the previous claims from 14 to 21~~ claim 14, wherein said ~~step~~ (a) is carried out at a temperature ranging from room temperature to ~~[[the]]~~ a boiling point of the donor compound D, until at least 80% of said compounds of Ti and Mg ~~have been~~ are dissolved.

Claim 23 (Currently Amended): The process according to ~~any of the previous claims from 14 to 22~~ claim 14, wherein said ~~step~~ (b) is carried out by ~~means of~~ evaporation, preferably by spray drying.

Claim 24 (Currently Amended): The process according to ~~any of the previous claims from 14 to 23~~ claim 14, wherein the molar ratio D_p/D in said ~~step~~ (d) ranges from 0.2 to 1.2.

Claim 25 (Currently Amended): The process according to ~~any of the previous claims from 14 to 24~~ claim 14, wherein said ~~step~~ (d) is carried out by heating the mixture to a temperature ranging from 40 to 100°C, for a period of time varying from 5 minutes to 5 hours.

Claim 26 (Currently Amended): The process according to claim 25, wherein the reaction mixture in said ~~step~~ (d) is heated to a temperature of 60 to 80°C, for a period ranging from 5 to 60 minutes.

Claim 27 (Currently Amended): A process for ~~[[the]]~~ preparation of a solid component according to ~~any of the previous claims from 1 to 13~~ claim 1, comprising reacting ~~the reaction~~ in an inert liquid medium, ~~[[of]]~~ a solid precursor ~~containing~~ comprising

titanium, magnesium, chlorine, an aprotic electron-donor compound D and optionally an inert granular solid ~~compound I~~, in ~~[[the]]~~ following molar ratios ~~between each other~~:

$$\text{Mg/Ti} = 1\text{-}50; \quad \text{D/Ti} = 2.0\text{-}20; \quad \text{Cl/Ti} = 6\text{-}100;$$

and wherein said inert granular solid ~~[[I]]~~ is in a quantity ranging from 0 to 95%,
with protic organo-oxygenated compound D_p, in ~~[[such]]~~ a quantity that the molar
ratio D_p/D ranges from 0.1 to 1.2, until equilibrium is reached.

Claim 28 (Currently Amended): The process according to claim 27, wherein said
~~solid precursor is characterized by the following~~ molar ratios are:

$$\text{Mg/Ti} = 1.5\text{-}10; \quad \text{D/Ti} = 4.0\text{-}12; \quad \text{Cl/Ti} = 10\text{-}30$$

and said inert granular solid ~~[[I]]~~ is in a quantity ranging from 20 to 60% by weight
with respect to the total weight of the precursor.

Claim 29 (Currently Amended): The process according to ~~any of the previous claims~~
~~27 and 28~~ claim 27, wherein the molar ratio D_p/D ~~in said step~~ ranges from 0.2 to 1.2.

Claim 30 (Currently Amended): The process according to ~~any of the previous claims~~
~~from 27 to 29~~ claim 27, wherein said reaction is carried out at a temperature ranging from 40
to 100°C, for a period varying from 5 minutes to 5 hours.

Claim 31 (Currently Amended): The process according to ~~the previous~~ claim 30,
wherein said reaction is carried out at a temperature ranging from 60 to 80°C, for a period of
5 to 60 minutes.

Claim 32 (Currently Amended): A catalyst for [[the]] (co)polymerization of ethylene, ~~which wherein the catalyst is obtained by means of contact and a process comprising~~ reaction of said solid component according to ~~any of the previous claims from 1 to 13~~ claim 1, with a co-catalyst comprising a hydrocarbonyl compound of a metal selected from the group consisting of Al, Ga, Mg, Zn and Li, wherein the atomic ratio between the metal in the co-catalyst and titanium in the solid component of catalyst ranges from 10:1 to 500:1.

Claim 33 (Previously Presented): The catalyst according to claim 32, wherein the atomic ratio between the metal in the co-catalyst and titanium in the solid component of catalyst ranges from 50:1 to 200:1.

Claim 34 (Currently Amended): The catalyst according to claim 32 ~~or 33~~, comprising titanium, magnesium, aluminum and chlorine, wherein said co-catalyst comprises an alkyl organometallic compound of aluminum.

Claim 35 (Currently Amended): The catalyst according to claim 34, wherein said organometallic compound of aluminum is ~~selected from~~ at least one of aluminum tri-alkyls ~~containing~~ comprising from 1 to 10 carbon atoms in each alkyl group.

Claim 36 (Currently Amended): The catalyst according to ~~any of the claims from 32 to 35~~ claim 32, wherein said solid component is activated before contact with said co-catalyst, by reaction with an aluminum alkyl or alkyl chloride represented by [[the]] following general formula (III):



wherein: R' is a linear or branched alkyl radical containing from 1 to 20 carbon atoms, X is ~~selected from one of~~ H and Cl, ~~preferably Cl~~, and ~~[["n"]]~~ n is a decimal number having ~~values a value~~ ranging from 1 to 3, ~~preferably from 2 to 3~~; and

~~in such a quantity that the~~ an Al/(D+D_p) ratio between the aluminium moles in said compound having formula (III) and the total of D and D_p moles in said solid component, ranges from 0.1 to 1.5.

Claim 37 (Previously Presented): The catalyst according to claim 36, wherein said R' in formula (III) is a linear or branched aliphatic radical, having from 2 to 8 carbon atoms.

Claim 38 (Currently Amended): The catalyst according to ~~anyone of the previous claims 36 and 37~~ claim 37, wherein said Al/(D+D_p) ratio ranges from 0.2 to 1.3, ~~preferably from 0.3 to 1.0~~.

Claim 39 (Currently Amended): The catalyst according to ~~any of the previous claims from 36 to 38~~ claim 36, wherein said solid component is activated ~~in two successive steps~~ by a first reaction ~~in the first step~~ with an aluminum trialkyl (n = 3 in formula (III)), and ~~in the second step~~ successively in a second reaction with an aluminum dialkyl chloride (n = 2, X = Cl, in formula (III)), in ~~such~~ a quantity that the overall molar ratio Al/(D+D_p) ranges from 0.1 to 1.3, ~~preferably from 0.4 to 1.1~~.

Claim 40 (Currently Amended): The catalyst according to claim 38, wherein, in said first step reaction, the molar ratio AlR₃/(D+D_p) ranges from 0.1 to 0.4 and, in the second step reaction, the molar ratio AlR₂Cl/(D+D_p) ranges from 0.2 to 0.6.

Claim 41 (Currently Amended): A process for ~~[[the]]~~ (co)polymerization of ethylene, comprising reacting ethylene and optionally at least one alpha-olefin, under ~~suitable a~~ polymerization conditions condition, in the presence of said catalyst according to ~~any of the previous claims from 32 to 40~~ claim 32.

Claim 42 (Currently Amended): The process according to claim 41, ~~carried out in gas phase with the~~ comprising carrying out a fluid-bed method, wherein a gaseous stream of ethylene and optional alpha-olefin is reacted in the presence of a quantity of catalyst, wherein ~~the a~~ a titanium concentration ranges from 1 to 5 ppm by weight with respect to ~~[[the]]~~ a consolidated production, at a temperature ranging from 70 to 115°C, and at a pressure ranging from 500 to 1000 kPa.

Claim 43 (Currently Amended): The process according to ~~the previous~~ claim 42, wherein said stream is introduced from the bottom of the polymerization reactor, partially comprising a stream in liquid form.

Claim 44 (Currently Amended): The process according to ~~anyone of~~ claim 42 ~~and 43,~~ in the presence of a catalyst according to any of the previous claims from 37 to 41, wherein said gaseous stream comprises ethylene and alpha-olefin.

Claim 45 (Currently Amended): The process according to ~~any of the preceding claims from 41 to 44~~ claim 41, wherein the molar ratio with ethylene ranges from 0.1 to 1.0.

Claim 46 (Currently Amended): The process according to ~~any of the preceding claims from 41 to 45~~ claim 41, wherein said α -olefin is ~~selected from~~ one of 1-butene, 1-

hexene and 1-octene and is in ~~such~~ a quantity that the molar ratio with ethylene ranges from 0.1 to 0.4.

Claim 47 (Currently Amended): The process according to ~~any of the preceding claims from 41 to 46~~ claim 41, ~~[[for]]~~ comprising obtaining linear polyethylene having a density ranging from 0.915 to 0.950 g/ml,

Claim 48 (Currently Amended): The process according to ~~any of the preceding claims from 42 to 46~~ for claim 42, comprising obtaining linear polyethylene having a density lower than 0.915 g/ml, ~~preferably ranging from 0.900 to less than 0.915 g/ml, comprising the copolymerization and copolymerizing,~~ in gas phase, ~~[[of]]~~ a gaseous mixture ~~including comprising~~ ethylene and at least one alpha-olefin having from 4 to 10 carbon atoms.

Claim 49 (Previously Presented): The process according to claim 48, wherein the gaseous mixture of ethylene and the at least one alpha-olefin is reacted in the presence of a sufficient quantity of catalyst, at a temperature ranging from 70 to 95°C, and a pressure ranging from 500 to 1000 kPa.

Claim 50 (Currently Amended): The process according to ~~any of the previous claims 48 and 49~~ claim 48, wherein said alpha-olefin is ~~selected from one of~~ 1-butene, 1-hexene and 1-octene, and is in ~~such~~ a quantity that the molar ratio with respect to ethylene ranges from 0.1 to 0.4.

Claim 51 (Currently Amended): The process according to ~~any of the previous claims from 41 to 50~~ claim 41, wherein said catalyst is formed *in situ* inside the reactor.

Claim 52 (Currently Amended): The process according to ~~any of the previous claims from 41 to 51~~ claim 41, wherein said linear polyethylene has a weight average molecular weight M_w ranging from 20,000 to 500,000 and a MWD (M_w/M_n) distribution ranging from 2.5 to 4.